

MATERIAL SAFETY DATA SHEET

1. SUBSTANCE AND SOURCE IDENTIFICATION

National Institute of Standards and Technology
Standard Reference Materials Program
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SRM Number: 2141
MSDS Number: 2141
SRM Name: Urea

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Description: This Standard Reference Material (SRM) is intended for use in the calibration of microchemical procedures for the determination of nitrogen in organic matter. The SRM is also useful for the standardization of techniques for the determination of nitrogen in which carbon and hydrogen are determined simultaneously. Each unit consists of 2 g of high-purity urea in a glass bottle.

Substance: Urea

Other Designations: carbamide; carbonyldiamide; carbamimidic acid; carbonyl diamide; amide of carbonic acid; alphantrate.

2. COMPOSITION AND INFORMATION ON HAZARDOUS INGREDIENTS

Component:	Urea
CAS Number:	57-13-6
EC Number (EINECS):	200-315-5
Nominal Mass Fraction (%):	100
EC Classification:	Xi (Irritant); not classified in Annex I of Directive 67/548/EEC
EC Risk:	R22 (harmful if swallowed) R36/37/38 (irritating to eyes, respiratory system and skin)
EC Safety:	S22 (do not breathe dust) S24/25 (avoid contact with skin and eyes)

3. HAZARDS IDENTIFICATION

NFPA Ratings (Scale 0-4):	Health = 2	Fire = 0	Reactivity = 0
Major Health Hazards:	Urea can irritate the skin, eyes, and respiratory tract. Prolonged exposure may cause emphysema and other chronic disorders. Ingestion may cause sore throat and abdominal pain.		
Physical Hazards:	Glass bottle may break or shatter.		
Potential Health Effects			
Inhalation:	Inhalation of urea dust or vapor can irritate the upper respiratory tract and lungs. Repeated or prolonged exposure is associated with a high risk of emphysema, weight loss, and disturbances of protein metabolism. Symptoms of exposure may include headache, nausea, vomiting, and fainting.		

Skin Contact:	Contact with urea can cause a burning and itching sensation, followed in some cases by redness or a rash.
Eye Contact:	Urea powder or concentrated solution can cause severe eye irritation. Prolonged eye contact can cause reversible damage to the cornea.
Ingestion:	Ingestion of urea may cause sore throat, abdominal pain, nausea, vomiting, and diarrhea.

Medical Conditions Aggravated by Exposure: Asthma, emphysema, and other disorders of the respiratory tract; disorders affecting the skin, eyes, or other target organs.

Listed as a Carcinogen/ Potential Carcinogen:

	Yes	No
In the National Toxicology Program (NTP) Report on Carcinogens	<u> </u>	<u>X</u>
In the International Agency for Research on Cancer (IARC) Monographs	<u> </u>	<u>X</u>
By the Occupational Safety and Health Administration (OSHA)	<u> </u>	<u>X</u>

Note: Rats have developed lymphomas and other tumors after long-term exposure to urea, but it is not currently recognized as a human carcinogen.

4. FIRST AID MEASURES

Inhalation: Move the person to fresh air immediately. Get medical aid if irritation persists or if breathing difficulty develops.

Skin Contact: Remove contaminated clothing. Wash affected skin with soap and water. If irritation persists, get medical aid and bring the container or label. Wash contaminated clothing before reusing.

Eye Contact: Remove contact lenses (if any). Flush eyes with running water for at least 15 minutes, keeping eyelids open and raising lids to remove all chemical. If irritation persists, get medical aid, and bring the container or label.

Ingestion: If a large dose was ingested and symptoms appear (see Section 3), contact a poison control center for instructions. Do not induce vomiting except on the advice of qualified medical personnel. Get medical aid if necessary, and bring the container or label.

5. FIRE FIGHTING MEASURES

Fire and Explosion Hazards: Urea may burn, but it does not ignite readily. For incompatible materials that may form explosive mixtures, see Section 10, Stability and Reactivity.

Extinguishing Media: Use extinguishing media appropriate to the surrounding fire: water spray, dry chemical, carbon dioxide, or foam.

Fire Fighting: Avoid inhalation of material or combustion byproducts. Wear full protective clothing and NIOSH-approved self-contained breathing apparatus (SCBA).

Flash Point (°C): N/A

Autoignition (°C): N/A

Lower Explosive Limit (LEL): N/A

Upper Explosive Limit (UEL): N/A

Flammability Class (OSHA): N/A

Products of Combustion: Thermal decomposition of urea may produce biuret, corrosive fumes of ammonia, and toxic oxides of nitrogen and carbon.

6. ACCIDENTAL RELEASE MEASURES

Occupational Release: Isolate the spill area and remove any sources of ignition. Cleanup personnel must wear personal protective equipment (Section 8). Sweep up material and place in a suitable container for disposal, using a method that does not generate dust.

Disposal: Refer to Section 13, "Disposal Considerations".

7. HANDLING AND STORAGE

Storage: Store in a tightly closed container at room temperature (30°C or cooler). Protect from heat, moisture, sunlight, and mechanical damage. Keep away from incompatible materials and ignition sources.

Safe Handling Precautions: Wear suitable gloves, or wash hands after contact. Do not eat, drink, or smoke while handling this material.

8. EXPOSURE CONTROLS AND PERSONAL PROTECTION

Exposure Limits: No TLV has been established for this material. Limits for total dust, nuisance dust, or particulates not otherwise classified:

ACGIH TLV-TWA: 10 mg/m³ (inhalable particles); 3 mg/m³ (respirable particles)
OSHA TWA-PEL: 15 mg/m³ (total dust); 5 mg/m³ (respirable dust)

Ventilation: Use local or general exhaust to keep employee exposures below limits. Local exhaust ventilation is preferred because it can control contaminant emissions at the source, preventing dispersion into the general work area. Refer to the ACGIH document *Industrial Ventilation, a Manual of Recommended Practices*.

Respirator: If necessary, refer to the *NIOSH Guide to the Selection and Use of Particulate Respirators Certified under 42 CFR 84* for selection and use of respirators certified by NIOSH.

Eye Protection: Use chemical safety goggles where dusting or splashing of solutions may occur. See OSHA standard (29 CFR 1910.133) or European Standard EN166. The employer should provide an emergency eye wash fountain and safety shower in the immediate work area.

Personal Protection: Wear appropriate gloves and protective clothing to minimize contact with skin.

9. PHYSICAL AND CHEMICAL PROPERTIES

Component: Urea

Appearance and Odor: Colorless to white, hygroscopic powder, crystals, or pellets; slight ammonia-like odor.

Relative Molecular Weight: 60.06

Molecular Formula: (NH₂)₂CO

Density (g/cm³): 1.32

Solvent Solubility: Soluble in methanol, pyrimidine, absolute alcohol, glycerol, concentrated hydrochloric acid, and acetic acid. Slightly soluble in ether. Insoluble in chloroform.

Water Solubility: Soluble

Boiling Point (°C): N/A (decomposes)

Melting Point (°C): 134 (273 °F)

Vapor Density (Air = 1): 2.07

pH: 7.1 (10 % solution @ 23 °C)

10. STABILITY AND REACTIVITY

Stability: X Stable Unstable

Stable at normal temperature and pressure.

Conditions to Avoid: Heat, sparks, open flames, sparks, incompatible materials.

Incompatible Materials: Urea is incompatible with nitrates, alkalis, and strong oxidizers (fire or explosion hazard). Violent decomposition may occur when urea is heated with gallium perchlorate. Urea may also explode when combined with any of the following: calcium hypochlorite; potassium nitrate; sodium hypochlorite; sodium nitrate; dichloromaleic anhydride and sodium chloride (at temperatures above 118 °C); phosphorus pentachloride or nitric acid (explosion possible on heating); or titanium tetrachloride (after prolonged storage). Urea may ignite on contact with chromyl chloride and (if stirred) with nitrosyl perchlorate.

Fire/Explosion Information: See “Incompatible Materials” for explosive mixtures.

Hazardous Decomposition: Thermal decomposition of urea may produce biuret, corrosive fumes of ammonia, and toxic oxides of nitrogen and carbon.

Hazardous Polymerization: Will Occur X Will Not Occur

11. TOXICOLOGICAL INFORMATION

Route of Entry: X Inhalation X Skin X Ingestion

Toxicity Data:

Rat, oral, LD₅₀: 8471 mg/kg

Rat, inhalation, TC_{Lo} (17 weeks): 288 mg/m³

Mouse, oral, LD₅₀: 11g/kg

Human, contact, mild skin irritation, 22 mg for 3 days

Target Organ(s): Skin, eyes, mucous membranes, respiratory tract, GI tract, kidneys.

Mutagen/Teratogen: Urea has caused birth defects and mutations in animals under laboratory conditions, but it is not considered to be a human reproductive hazard.

Health Effects: See “Section 3”.

12. ECOLOGICAL INFORMATION

Ecotoxicity Data:

Giant gourami (*Colisa fasciata*), LC₅₀ (96 hrs): 5 mg/L

Tilapia (*Tilapia mossambica*), LC₅₀ (96 hrs): 660 mg/L

Environmental Summary: If released into the environment, urea may promote eutrophication (overgrowth of algae) in surface waters. At high levels, it is toxic to some aquatic organisms.

13. DISPOSAL CONSIDERATIONS

Waste Disposal: Dispose of container and unused contents in accordance with federal, state, and local requirements, which vary according to location. Although this material is not a listed RCRA hazardous waste, it may exhibit one or more characteristics of a hazardous waste and thus requires appropriate analysis to determine specific disposal requirements.

14. TRANSPORTATION INFORMATION

U.S. DOT and IATA: Not regulated.

15. REGULATORY INFORMATION

U.S. REGULATIONS

CERCLA Sections 102a/103 (40 CFR 302.4): Not regulated.

SARA Title III Section 302: Not regulated.

SARA Title III Section 304: Not regulated.

SARA Title III Section 313: Not regulated.

OSHA Process Safety (29 CFR 1910.119): Not regulated.

SARA Title III Sections 311/312 Hazardous Categories (40 CFR 370.21):

ACUTE: Yes

CHRONIC: Yes

FIRE: No

REACTIVE: No

SUDDEN RELEASE: No

STATE REGULATIONS

California Proposition 65: Not regulated.

CANADIAN REGULATIONS

WHMIS Classification: Not regulated; D2B, materials causing other toxic effects.

WHMIS Ingredient Disclosure List: Not listed.

CEPA Domestic Substances List (DSL): Listed.

EUROPEAN REGULATIONS

EU/EC Classification: Xi (Irritant); not classified in Annex I of Directive 67/548/EEC

NATIONAL INVENTORY STATUS

U.S. Inventory (TSCA): Listed

TSCA 12(b), Export Notification: Not listed

16. OTHER INFORMATION

Sources:

Hazardous Substances Data Bank (HSDB): *Urea*.

IUCLID Chemical Data Sheet: *Urea*. *European Chemicals Bureau*, 18 Feb 2000.

PAN Pesticide Database: *Urea*.

Disclaimer: Physical and chemical data contained in this MSDS are provided only for use as a guide in assessing the hazardous nature of the material. The MSDS was prepared carefully, using current references; however, NIST does not certify the data in the MSDS. The certified values for this material are given in the NIST Certificate of Analysis.